



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,082	06/25/2003	David R. Medeiros	FIS920030159US1	1081

32074 7590 05/05/2005

INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 300-482  
2070 ROUTE 52  
HOPEWELL JUNCTION, NY 12533

EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT	PAPER NUMBER
----------	--------------

1756

DATE MAILED: 05/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/604,082

Applicant(s)

MEDEIROS ET AL.

Examiner

Daborah Chacko-Davis

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5,7,9-11 and 13-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,9-11,13-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 7, 9-11, 13-20, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182534 (Varanasi et al) in view of U. S. Patent No. 6,399,273 (Yamada et al).

Varanasi, in the abstract, in paragraphs [0008], [0009], [0010], [0030], [0032], [0045], [0046], [0047], [0056], [0057], [0058], [0059], [0060], [0061], and [0068] discloses a method of forming resist structures to transfer patterns to an underlying layer (material layer) in order to form features that are less than 130nm in size, wherein the method includes applying a positive resist composition to the desired semiconductor substrate, the resist composition comprises i) an acid sensitive imaging polymer, and ii) a radiation sensitive acid generator, wherein the imaging polymer includes plural acid-labile moieties (PALM groups) that inhibit solubility of the resist in the absence of a generated acid (i.e., low activation energy); the method includes performing a pattern wise-exposure on the resist layer such that acid is generated in the exposed regions of the layer, treating the exposed regions with bulky groups (during exposure or post-exposure, bulky deprotection co-reactant product is formed in the resist) so as to

Art Unit: 1756

promote acid catalyzed reactions (promoting alkaline solubility in acid generated areas, exposed areas) for a sufficient time (avoiding too much shrinkage), developing the exposed resist layer to form a pattern by contacting the resist layer with a developer to remove the exposed areas of the resist, and transferring the pattern of the resist structure to the underlying material layer by reactive ion etching (claims 1, 4, 13, and 18). Varanasi, in [0056], discloses that the material layer may be a conductor layer, a ceramic layer or a semiconducting layer (claim 2). Varanasi, in [0030], discloses that the acid-labile moiety is either a ketal or an acetal (claims 3, and 17). Varanasi, in [0056], and [0062] discloses an intermediate layer (ARC) between the material layer and the resist layer, such that the pattern is transferred from the patterned resist to the intermediate layer (ARC or hard mask layer) prior to the transfer to the underlying layer (material layer) (claim 5). Varanasi, in [0030], [0031], and [0032], discloses that the deprotection group (bulky group, Q) is present in the imaging polymer during exposure (claim 7). Varanasi, in [0060], discloses that the resist is treated with an aqueous solution (water as the reactant) (claim 9). Varanasi, in [0067], discloses that the exposure is performed in an anhydrous condition (vacuum conditions) (claim 10). Varanasi, in [0059], discloses that the post-exposure baking is performed in atmosphere (not vacuum, heated atmosphere is humid) (claims 11, and 20). Varanasi, in [0058], and [0067], discloses that the exposure was performed at a wavelength of about 193 nm (claim 14). Varanasi, in [0055], discloses that eUV radiations can be employed for performing exposures (claim 15). Varanasi, in [0058], discloses that an electron beam is used to expose the

Art Unit: 1756

resist layer (claim 16). Varanasi, in [0061], discloses that patterned structure can be used to form metal wiring lines (depositing metal in the spaces between the resist pattern) (claim 19).

The difference between the claims and Varanasi is that Varanasi does not disclose that the exposed resist layer is treated to a temperature is about 20-50°C for about 1-30 minutes.

Yamada, in col 18, lines 60-65, discloses that the heat treatment is performed at a temperature of about 60°C for a period of about 0.1 to 30 minutes.

Therefore, it would be obvious to a skilled artisan to modify Varanasi by employing the temperature suggested by Yamada during the heat treatment (post exposure heating) because Yamada, in col 4, lines 37-47, discloses that upon heating the exposed resist layer, the unexposed region of the polymer undergoes chemical transformations rendering the unexposed regions of the polymer insoluble to developing solutions.

### ***Response to Arguments***

3. Applicant's arguments, see Remarks, filed January 18, 2005, with respect to claims 6, 8, and 11, have been fully considered and are persuasive. The 112 rejection made in the previous office action (paper no. 0928) has been withdrawn.

4. Applicant's arguments filed on January 18, 2003, in regards to claims 1, and 18, have been fully considered but they are not persuasive. The 102 rejection made in the previous office action (paper no. 0928) has been withdrawn

Art Unit: 1756

because of the amendments made over claims 1, and 18. A 103 rejection is made over the present claims.

A) Applicants argue that Varanasi does not teach the claimed combination a photoresist of low activation energy and mild post-exposure treatment.

Varanasi, in [0009], teaches a photoresist composition of low activation groups. Varanasi is not depended upon to disclose the claimed temperature of mild post exposure treatment. Yamada teaches that the exposed photoresist can be heated to about 60°C (mild post exposure treatment). Additionally, it would be obvious to use temperatures below 60°C, including 50°C, since Yamada recites "about 60°C".

B) Applicants argue that Varanasi does not teach the ability to resolve features at 50nm half pitch.

Varanasi, in [0008], discloses that lithographic method employed by Varanasi enables the resolution of features less than 130nm; less than 130nm includes 50nm.

### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory

Art Unit: 1756

action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

  
May 2, 2005.  
**JOHN A. MCPHERSON**  
**PRIMARY EXAMINER**